HRS DOCUMENTATION RECORD--REVIEW COVER SHEET

Name of Site: Raritan Bay Slag

Contact Persons

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Pathways, Components, or Threats Not Scored

The Surface Water Migration Pathway produces an overall score above the minimum required for the site to qualify for the National Priorities List; the Ground Water, Soil Exposure, and Air Migration Pathways were not scored because the listing decision is not significantly affected by those pathways.

HRS DOCUMENTATION RECORD

Name of Site: Raritan Bay Slag Date Prepared: April 2009

EPA ID No.: NJN000206276 (Ref. 3, p. 1)

EPA Region: 2

Street Address of Site*: Bayview Drive, Old Bridge, New Jersey 08879
Old Spye Road; north of Route 35 overpass, Sayreville, New Jersey 08879

The Laurence Harbor Seawall (i.e., Source 1) is part of the Old Bridge Waterfront Park, located along Bayview Drive in Old Bridge Township, New Jersey (Ref. 7, p. 1; 12, p. 3). The western jetty of the Cheesequake Inlet (i.e., Source 2) is located on Old Spye Road , north of the Route 35 overpass in Sayreville, New Jersey (Ref. 4, Figure 1, Figure 2, Figure 4; 12, pp. 3, 4). Both sources have the zip code of 08879 (Ref. 12, p.3).

County and State: Middlesex County, NJ

General Location in the State: Central New Jersey - Raritan Bay's southern shoreline between the western jetty at the Cheesequake Creek Inlet and Margaret's Creek

Topographic Map: Source #1: Keyport, New Jersey – New York
Source #2: South Amboy, New Jersey – New York

Location	Source No.	USGS Quadrangle	Latitude	Longitude
Laurence Harbor Seawall	1	Keyport, NJ-NY	40° 27′ 52.52″ North	-74° 15′28.86″ West
Western Jetty - Cheesequake Creek Inlet	2	South Amboy, NJ – NY	40° 27′ 28.22″ North	-74° 14′ 26.07″ West

Reference Points: Latitude and Longitude coordinates were measured from the approximate centers of the Laurence Harbor Seawall (i.e., Source 1) and the western jetty of the Cheesequake Creek Inlet (i.e., Source 2) (Ref. 5; 6; 11).

* The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area where the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

Scores

Ground Water Pathway	Not Scored
Surface Water Pathway	100.00
Soil Exposure Pathway	Not Scored
Air Pathway	Not Scored
HRS SITE SCORE	50.00

WORKSHEET FOR COMPUTING HRS SITE SCORE
RARITAN BAY SLAG

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	Not Scored	
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	100.00	10,000.00
2b.	Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	Not Scored	
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	100.00	10,000.00
3.	Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	Not Scored	
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	Not Scored	
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$	10,000.00	
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root	50.00	

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
RARITAN BAY SLAG

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors DRINKING WATER THREAT	MAXIMUM VALUE	VALUE ASSIGNED
Likelihood of Release		
1. Observed Release	550	550
2. Potential to Release by Overland Flow		
2a. Containment	10	not scored
2b. Runoff	25	not scored
2c. Distance to Surface Water	25	not scored
2d. Potential to Release by Overland Flow [lines 2a (2b+2c)]	500	not scored
3. Potential to Release by Flood		
3a. Containment (Flood)	10	not scored
3b. Flood Frequency	50	not scored
3c. Potential to Release by Flood (lines 3a x 3b)	500	not scored
4. Potential to Release (lines 2d+3c)	500	not scored
5. Likelihood of Release	550	550
Waste Characteristics		
6. Toxicity/Mobility	*	10,000
7. Hazardous Waste Quantity	*	100
8. Waste Characteristics	100	32
Targets		
9. Nearest Intake	50	0
10. Population		
10a. Level I Concentrations	**	0
10b. Level II Concentrations	**	0
10c. Potential Contamination	**	0
10d. Population (lines 10a+10b+10c)	**	0
11. Resources	5	5
12. Targets (lines 9+10d+11)	**	5
13. DRINKING WATER THREAT SCORE ([lines 5 x 8 x 12]/82,500)	100	1.06

* Maximum value applies to waste characteristics category.
** Maximum value not applicable

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
RARITAN BAY SLAG

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors HUMAN FOOD CHAIN THREAT	MAXIMUM VALUE	VALUE ASSIGNED
Likelihood of Release		
14. Likelihood of Release (same as line 5)	550	550
Waste Characteristics		
15. Toxicity/Persistence/Bioaccumulation	*	5.00E+07
16. Hazardous Waste Quantity	*	100
17. Waste Characteristics	1,000	180
Targets		
18. Food Chain Individual	50	45
19. Population		
19a. Level I Concentrations	**	0
19b. Level II Concentrations	**	0.06
19c. Potential Human Food Chain Contamination	**	0
19d. Population (lines 19a+19b+19c)	**	0.06
20. Targets (lines 18+19d)	**	45.06
21. HUMAN FOOD CHAIN THREAT SCORE ([lines 14 x 17 x 20]/82,500)	100	54.07

* Maximum value applies to waste characteristics category.
** Maximum value not applicable

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
RARITAN BAY SLAG

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors ENVIRONMENTAL THREAT	MAXIMUM VALUE	VALUE ASSIGNED
Likelihood of Release		
22. Likelihood of Release (same as line 5)	550	550
Waste Characteristics		
23. Ecosystem Toxicity/Persistence/Bioaccumulation	*	5.00E+07
24. Hazardous Waste Quantity	*	100
25. Waste Characteristics	1,000	100
Targets		
26. Sensitive Environments		
26a. Level I Concentrations	**	0
26b. Level II Concentrations	**	105
26c. Potential Contamination	**	not scored
26d. Sensitive Environments (lines 26a+26b+26c)	**	105
27. Targets (line 26d)	**	105
28. ENVIRONMENTAL THREAT SCORE ([lines 22 x 25 x 27]/82,500)	60	60
29. WATERSHED SCORE (lines 13 + 21 + 28)	100	100
30. SW: OVERLAND/FLOOD COMPONENT SCORE (S_{of})	100	100
SURFACE WATER MIGRATION PATHWAY SCORE (S_{sw})	100	100

* Maximum value applies to waste characteristics category.
** Maximum value not applicable

REFERENCES

Reference Number	Description of the Reference
1.	U.S. Environmental Protection Agency (EPA), Revised Hazard Ranking System, Final Rule, 40 CFR 300, Federal Register Volume 55, No. 241, page 51532 et seq., December 14, 1990. [137 pp.]
2.	EPA, Superfund Chemical Data Matrix, SCDM Data Version: 1/27/04, excerpts, from http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm, January 28, 2004. [8 pp.]
3.	EPA, Superfund Information Systems, Superfund Site Information, Raritan Bay Slag. From http://cfpub.epa.gov/; Accessed and printed on October 7, 2008. [2 pages]
4.	WESTON, Figure 1: Site Location Map, October 2008; Figure 2: Study Area Map, Raritan Bay Slag, Old Bridge Township and Sayreville, Middlesex County, New Jersey, October 2008; Figure 3: 15-Mile Surface Water Pathway Map, Raritan Bay Slag, Old Bridge / Sayerville, NJ, February 5, 2009; Figure 4: Zoning Map; Borough of Sayerville, Middlesex County, New Jersey, December 1999. [4 pp.]
5.	U.S. Department of the Interior Geological Survey (USGS), 7.5-Minute Series (Topographic) Quadrangle for: "South Amboy, NJ-NY", 1995. [1 p.]
6.	U.S. Department of the Interior Geological Survey (USGS), 7.5-Minute Series (Topographic) Quadrangle for: "Keyport, NJ-PA", 1995. [1 p.]
7.	Kropp, Irene, New Jersey Department of Environmental Protection (NJDEP), Site Remediation and Waste Management, Letter to Susan Janowiak, EPA, Emergency and Remedial Response Division, Subject: Removal Action Site Consideration for Lead Contamination along Laurence Harbor Seawall, April 24, 2008. [3 pp.]
8.	Foerter, Dennis, WESTON, Project Note to Raritan Bay Slag File, Subject: NJDEP Surface Soil Sampling Along Old Bridge Waterfront Park Walkway; with attached references, October 1, 2008. [58 pp.]
9.	WESTON, Field Log Books 523-4E-ACUQ, RST2-02-F-0674, RST2-02-F-0675, and RST2-02-F-0676, Raritan Bay Slag; with attached photo documentation, Field Activities conducted by WESTON from August 21, 2008 through January 16, 2009. [68 pp.]
10.	Foerter, Dennis. WESTON, Project Note to Raritan Bay Slag File, Subject: Raritan Bay Tides, February 5, 2009. [2 pp.]
11.	Foerter, Dennis, WESTON, Project Note to Raritan Bay Slag File, Subject, Latitude and Longitude and Source Area Calculations, Raritan Bay Slag, December 23, 2008. [2 pp.]
12.	Hagstrom Map Company, Inc., Street Map, Middlesex County, New Jersey, excerpts, 2001. [4 pp.]
13.	Foerter, Dennis, WESTON, Project Note to Raritan Bay Slag File, Subject: National Estuary Program – New York – New Jersey Harbor; with attached references, October 13, 2008. [11 pp.]
14.	Foerter, Dennis, WESTON, Project Note to Raritan Bay Slag File, Subject: Sensitive Environments, October 14, 2008. [13 pp.]

REFERENCES (continued)

Reference Number	Description of the Reference
15.	Foerter, Dennis, WESTON, Region 2 SAT, Telecon Note to Raritan Bay Slag, Subject: NJDEP 2007 Soil Sampling Events, October 14, 2008. [1 p.]
16.	Foerter, Dennis, WESTON, Project Note to Raritan Bay Slag File, Subject: EPA Investigation conducted in September 2008, January 12, 2009. [2 pp. and 2 Figures]
17.	Morales, Julissa, WESTON, Sampling Trip Report, Raritan Bay Slag Site, DCN No. RST2-02-F-0708, W.O. No., 20401.032.010.2064, Case No. 37836. October 15, 2008. [68 pp.]
18.	EPA Hazardous Waste Support Section. Record of Communication and attached CLP Data Assessment, Subject: CLP [Inorganic] Data Package for Quality Assurance Review, Site: Raritan Bay Slag, Case #: 37836, SDG # MB52W5 and MB5341. October 2, 2008. [29 pp.]
19.	Middlesex County, Parks and Recreation, Old Bridge Waterfront Park. From http://www.co.middlesex.nj.us/parksrecreation/old.asp; Accessed and printed on September 26, 2008. [2 pp.]
20.	GPO Access, Electronic Code of Federal Regulations (e-CFR) Title 4-: Protection of Environment, Part 261 – Identification and Listing of Hazardous Waste, Subpart C – Characteristics of Hazardous Waste. From http://ecfr.gpoaccess.gov/; Accessed and printed on December 5, 2008. [6 pp.]
21.	Foerter Dennis. WESTON, Project Note to Raritan Bay Slag File, Subject: Sample Quantitation Limits – Raritan Bay Slag Site, February 5, 2009. [70 pp.]
22.	EPA Hazardous Waste Support Section. Record of Communication and attached CLP Data Assessment, Subject: CLP [Inorganic] Data Package for Quality Assurance Review, Site: Raritan Bay Slag, Case #: 37836, SDG # MB5347, MB5351, MB5356, and MB5395. September 26, 2008. [77 pp.]
23.	EPA Hazardous Waste Support Section. Record of Communication and attached CLP Data Assessment, Subject: CLP [Inorganic] Data Package for Quality Assurance Review, Site: Raritan Bay Slag, Case #: 37836, SDG # MB5319, MB5336, and MB53A9. September 29, 2008. [80 pp.]
24.	EPA Hazardous Waste Support Section. Record of Communication and attached CLP Data Assessment, Subject: CLP [Inorganic] Data Package for Quality Assurance Review, Site: Raritan Bay Slag, Case #: 37836, SDG # MB53A0, MB52W6, and MB52Y7. September 26, 2008. [72 pp.]
25.	EPA Hazardous Waste Support Section. Record of Communication and attached CLP Data Assessment, Subject: CLP [Inorganic] Data Package for Quality Assurance Review, Site: Raritan Bay Slag, Case #: 37836, SDG # MB52Y1, MB53C6, MB53H6, and MB53L6. October 2, 2008. [78 pp.]
26.	Foerter, Dennis, Weston, Project Note Project Note to Raritan Bay Slag File, Subject: Grain Size Data for Sediment Samples – Raritan Bay Slag, January 12, 2009. [183 pp.]
27.	NOAA, Nautical Chart 12324, Intercoastal Waterway, New Jersey Sandy Hook to Little Egg Harbor. From http://www.charts.noaa.gov/OnLineViewer/12324.sh tml; Accessed and printed on January 12, 2009. [6 pages]

REFERENCES (continued)

Reference Number	Description of the Reference
28.	Foerter, Dennis, Weston, Project Note to Raritan Bay Slag File, Subject: Qualified Data – Raritan Bay Slag, January 6, 2009. [2 pp.]
29.	EPA, Using Qualified Data to Document an Observed Release and Observed Contamination, Quick Reference Fact Sheet, EPA 540-F-94-028, OSWER 9285.7-14FS, PB94-963311, November 1996. [18 pp.]
30.	New Jersey Department of Environmental Protection, Site Investigation Report for Old Bridge Township - Margarets Creek Property, April 18, 2007. [4 pp.]
31.	Advanced GeoServices Corp. for NL Industries, Draft Remedial Action Workplan, Block 1, Lot 54.11 Township of Old Bridge, Middlesex County, New Jersey, May 2008. [24 pp.]
32.	STL Burlington, Sample Data Packages, SDG 119110 and 119099, April 2007. [2,138 pp.]
33.	New Jersey Department of Environmental Protection, Critical Habitat Map for Margarets Creek Property (undated). [1 p.]
34.	New Jersey Department of Environmental Protection, Critical Habitat Map for Margarets Creek Property indicating Black Crowned Night Heron habitat (undated). [1 p.]

INTRODUCTION

The Raritan Bay Slag site (EPA ID No. NJN000206276) consists of three areas of lead-contaminated slag deposition located along the southern shore of the Raritan Bay in Old Bridge Township and Sayreville, Middlesex County, New Jersey (Ref. 3, p. 1; 4, Figure 1, Figure 2, Figure 4; 7, p. 1; 12, pp. 3-4; 31, p. 10; 33, p. 1). The first area is the location of the Laurence Harbor seawall located adjacent to the Old Bridge Waterfront Park in the Laurence Harbor section of Old Bridge Township, Middlesex County, New Jersey (Ref. 4, Figure 1, Figure 2; 12, p. 3). The second area consists of the western jetty extending from the Cheesequake Creek Inlet into Raritan Bay. This jetty is located in Sayreville, Middlesex County, New Jersey (Ref. 4, Figure 1, Figure 2, Figure 4; 12, pp. 3, 4). The third area is roughly 47 acres in size and is defined by Margaret's Creek and its associated sensitive environments (Ref. 31 p. 6; 33, p.1).

Background information indicates that in September 1972, the New Jersey Department of Environmental Protection (NJDEP) was advised by a local government official that lead-bearing waste material was being disposed of along the Laurence Harbor beachfront on Raritan Bay. NJDEP background information indicates that by a letter from NL Industries, Inc. (NL) to NJDEP (dated December 1972), NL acknowledged that slag which consists of non-recoverable low yield metallic waste from blast furnace and blast furnace rubble was disposed of by Liberty Trucking Company at their property in Madison Township, Route 35, New Jersey. Madison Township is currently known as Old Bridge Township. NL used battery plates from lead/acid storage batteries as the principal feed material for the blast furnace located at its plant in Perth Amboy, New Jersey (Ref. 7, pp. 2).

On May 23, 2007 and July 24, 2007, NJDEP conducted soil sampling events along the southern shoreline of the Raritan Bay adjacent to the Old Bridge Waterfront Park. Analytical results from these sampling events indicated the presence of lead at concentrations as high as 142,000 parts per million, which is above the state's unrestricted use and restricted use Soil Cleanup Criteria (Ref. 7, p. 2; 8, pp. 1-58). NJDEP described the waste material associated with the Laurence Harbor seawall as consisting of various materials including large pieces of rust-colored slag. Other waste (i.e., slag) materials associated with the low-yield metallic waste from blast furnace and blast furnace rubble included finer grained "nuggets" as well as battery casing fragments of various sizes (Ref. 7, p. 2). NJDEP officials stated that it is possible that some of the finer waste materials comprising the Laurence Harbor Seawall may have been included in the soil samples (Ref. 15, p. 1). In addition, materials such as battery casing chips, refractory bricks, and slag are found in Margaret's Creek (Ref. 30, p. 3; 31 pp. 6, 10).

Old Bridge officials worked with NJDEP to notify the public in writing about health concerns for the lead waste material and restrict access through signage and some fencing. However, due to physical constraints, it was not practical to completely fence off contaminated areas and access to these areas remained a concern. On April 24, 2008, NJDEP referred the site to the U.S. Environmental Protection Agency (EPA) Emergency and Remedial Response Division for removal action consideration (Ref. 7, pp. 1-3). NJDEP's concern was that limited site access restrictions previously implemented at the site would not adequately protect human health and the environment for an extended time due to the uncontrolled lead contamination that remains on the seawall and on a portion of the public beach, both part of Waterfront Park and along the Raritan Bay in Laurence Harbor portion of Old Bridge (Ref. 7, pp. 1-2).

In September 2008, EPA conducted a sampling investigation of the site. During field activities, several portions of the Laurence Harbor seawall, and at least the top portion of the western jetty of the Cheesequake Creek Inlet, were observed to consist of slag materials. Battery casing fragments were also noted in both areas. During field activities, the Raritan Bay was observed to come in contact with the slag in both locations during high tide (Ref. 16, pp. 1, 2). During the September 2008 EPA investigation, surface and subsurface soil, surface water and sediment samples were collected in the area of the Laurence Harbor seawall and the western jetty of the Cheesequake Creek Inlet (Ref. 17, pp. 1, 5-13). Analytical results from extracts of waste/soil samples (analyzed for Toxicity Characteristic Leaching Procedure metals) collected from the Laurence Harbor seawall and the western jetty of Cheesequake Creek Inlet indicated the presence of lead at concentrations above the Resource Conservation and Recovery Act (RCRA) regulatory level of 5 milligrams per liter (Ref. 17, pp. 5, 7, 8, 13, Figure 2; 16, p. 1; 18, pp. 2-9, 14; 20, p. 5). Analytical results from sediment samples (analyzed for Target Analyte List (TAL) metals) collected from Raritan Bay indicated the presence of lead at concentrations significantly above concentrations detected in selected background samples in the areas of the Laurence Harbor Seawall and the western jetty of the Cheesequake Creek Inlet (Ref. 17, pp. 1, 8-12, Figure 2; 22, pp. 6, 7, 9-12, 15, 57-61, 64, 65; 23, pp. 30-40, 63-65; 24, pp. 2-13; 25, pp. 15, 16).

Observed releases to surface water by direct observation are documented through the direct contact of the Raritan Bay with lead-contaminated slag associated with the Laurence Harbor Seawall and the western jetty of the Cheesequake Creek Inlet (Ref. 9, pp. 2, 4, 5, 7, 8, 10, 11, 12; 16, p. 1). In addition, analytical data from sediment samples collected in September 2008 indicate observed releases through chemical analysis to the Raritan Bay from lead-contaminated slag associated with the Laurence Harbor Seawall and the western jetty of the Cheesequake Creek Inlet (Ref. 17, pp. 8-12; 22, pp. 6, 7, 10-12, 15, 58-61, 64, 65; 23, pp. 30-39, 63-65; 24, pp. 2-13; 25, pp. 15, 16). The Raritan Bay is known to be used as a fishery and a sensitive environment (i.e., a sensitive area identified under the National Estuary Program; and, a state-designated water body for the maintenance of aquatic life) (Ref. 9, pp. 3-5; 13, pp. 1-11; 14, pp. 1-13). The Raritan Bay, and more particularly Old Bridge Waterfront Park in Middlesex County, is also a designated recreation area; swimming and fishing activities were observed in the vicinity of the Laurence Harbor seawall and the western jetty of the Cheesequake Creek Inlet (Ref. 16, p. 2; 19, p. 1). Other nearby receptors include approximately 0.13 mile of emergent wetland frontage located along the eastern portion of the Laurence Harbor seawall (Ref. 4, Figure 2). Margaret's Creek is enveloped by wetlands, and is habitat for state threatened species: the Black-Crowned Night Heron (Ref. 30, p. 4; 34, p. 1)

There may be additional areas along the southern shoreline of Raritan Bay where the seawall consists of slag materials similar to those observed on the Laurence Harbor seawall and western jetty of the Cheesequake Inlet. EPA is unable to evaluate these areas at this time (Ref. 16, p. 2).

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

Number of the source: 1

Name and description of the source: Slag Waste Pile – Laurence Harbor Seawall

Source Type: Pile

Source 1 consists of the Laurence Harbor seawall located on the southern shoreline of the Raritan Bay (Ref. 4, Figures 1 and 2). Background information indicates that in September 1972, the NJDEP was advised by a local government official that lead-bearing waste material was being disposed of along the Laurence Harbor beachfront on Raritan Bay. NJDEP background information indicates that by a letter from NL Industries, Inc. (NL) to NJDEP (dated December 1972), NL acknowledged that slag which consists of non-recoverable low yield metallic waste from blast furnace and blast furnace rubble are disposed of by Liberty Trucking Company at their property in Madison Township, Route 35, New Jersey. Madison Township is currently known as Old Bridge Township. NL used battery plates from lead/acid storage batteries as the principal feed material for the blast furnace located at its plant in Perth Amboy, New Jersey (Ref. 7, p. 2).

On May 23, 2007 and July 24, 2007, NJDEP conducted soil sampling events along the southern shoreline of the Raritan Bay adjacent to the Old Bridge Waterfront Park. Analytical results from these sampling events indicated the presence of lead at concentrations as high as 142,000 parts per million, which is above the state's unrestricted use and restricted used Soil Cleanup Criteria (Ref. 7, p. 2; 8, pp. 1-57). NJDEP described the waste material associated with the Laurence Harbor seawall as consisting of various materials including large pieces of rust-colored slag. Other waste (i.e., slag) materials associated with the low-yield metallic waste from blast furnace and blast furnace rubble included finer grained "nuggets" as well as battery casing fragments of various sizes. NJDEP officials stated that it is possible that some of the finer waste materials comprising the Laurence Harbor Seawall may have been included in the soil samples (Ref. 15, p. 1).

In September 2008, EPA conducted a sampling investigation of the site. Waste/soil samples were collected from the Laurence Harbor Seawall (Ref. 17, pp. 5, 8, Figure 2; 9, pp. 14-16, 23, 25-29; 16, p. 1). Selected samples were analyzed for Toxicity Characteristic Leaching Procedure (TCLP) metals (Ref. 17, pp. 1, 13). Analytical results from extracts of samples collected from the seawall indicated the presence of lead at concentrations above the RCRA regulatory level of 5 milligrams per liter (mg/L) (Ref. 17, pp. 5, 13, Figure 2; 18, pp. 7, 8, 9; 20, p. 5).

Location of the source, with reference to a map of the site:

The slag waste pile composing the Laurence Harbor seawall (i.e., Source 1) is located along the southern shoreline of the Raritan Bay, immediately west of Margaret's Creek's discharge point to Raritan Bay (Ref. 4, Figures 1 and 2; 9, p. 5).

Containment

Release to surface water via overland migration:

Based on observations made during field activities conducted by EPA in September 2008, there are no containment features associated with the Laurence Harbor Seawall. No maintained engineered cover, a liner or a run-on control system and runoff management system were observed (Ref. 16, p. 1). In addition, slag materials were observed to be in direct contact with Raritan Bay during high tide, resulting in source 1 being located in surface water (Ref. 9, pp. 4, 10, 11, 12; 16, p. 1). In addition, analytical results from the TCLP samples collected from the Laurence Harbor Seawall indicate that lead in the waste is likely to migrate from the source (Ref. 17, pp. 5, 8, 13; 18, pp. 2, 5, 6; 20, p. 5). Based on an evaluation of the above conditions, an overland flow containment factor of 10 is assigned (Ref. 1, p. 51609).

Release to surface water via overland migration flood:

During field activities conducted by EPA in September 2008, no features were present to suggest that containment at the Laurence Harbor Seawall is designed, constructed, operated, and maintained to prevent a washout of hazardous substances by flood. Therefore, a flood containment factor of 10 is assigned (Ref. 1, p. 51611; 16, p. 1).

2.4.1 Hazardous Substances

In September 2008, EPA conducted a sampling investigation of the site. Soil samples were collected directly from the Laurence Harbor Seawall. Soil samples were collected and submitted for TCLP metals and mercury analyses; leachate from these samples were generated by EPA Method SW-846 1311 (i.e., TCLP) as modified in Modification Reference Number 1454.1. The leachate was then analyzed using Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) as per Contract Laboratory Program (CLP) Inorganic Statement of Work (SOW) ILM05.4 (Ref. 18, pp. 28, 29). Analytical results from samples collected from the seawall indicated the presence of lead at concentrations above the RCRA regulatory level of 5 mg/L (Ref. 17, pp. 5, 13, Figure 2; 18, pp. 7, 8, 9; 20, p. 5).

Hazardous Substance	Evidence	Reference(s)
Lead	TCLP soil samples, EPA, September 2008:	
	S01A (31,500 ug/L)	17, pp. 5, 13, 16, 33; 18, p. 7
	S02A (11,100 ug/L)	17, pp. 5, 13, 16, 33; 18, p. 8
	S03A (28,700 ug/L)	17, pp. 5, 13, 16, 33; 18, p. 9

Notes:

ug/L – micrograms per liter

Sample concentrations in parentheses

RCRA regulatory level for lead is 5 milligrams per liter (i.e., 5,000 ug/L) (Ref. 20, p. 5)

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to evaluate Tier A source hazardous waste quantity; therefore, hazardous constituent quantity is not scored (NS).

Hazardous Constituent Quantity (C) Value: NS

2.4.2.1.2 Hazardous Wastestream Quantity

The information available is not sufficient to evaluate Tier B source hazardous waste quantity; therefore, hazardous wastestream quantity is not scored (NS).

Hazardous Wastestream Quantity (W) Value: NS

2.4.2.1.3 Volume

The information available is not sufficient to evaluate Tier C source hazardous waste quantity; therefore, volume (V) is assigned a value of 0 (Ref. 1, p. 51591, Section 2.4.2.1.3).

Volume (V) Value: 0

2.4.2.1.4 Area

Source 1 is a waste pile containing lead-contaminated slag deposited within portions of the Laurence Harbor seawall along the southern shoreline of Raritan Bay (Ref. 4, Figures 1 and 2). This source is characterized by the presence of slag materials within the Laurence Harbor seawall. Based on analytical results from samples collected during the sampling event conducted by EPA in September 2008, it is apparent that lead contamination is present (Ref. 17, p. 5, Figure 2; 18, pp. 7, 8, 9; 20, p. 5). The estimated area surface area under the seawall is 64,324 square feet (ft^2) (Ref. 4, Figure 2; 11, p. 1). The source type is Pile, so the area value is divided by 13 to obtain the assigned value, as shown below (Ref. 1, p. 51591, Section 2.4.2.1.4, Table 2-5).

Area of source (ft^2): 64,324

Area (A) Assigned Value: (64,324)/(13) = 4,948

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source hazardous waste quantity value for Source 1 is 4,948 for Tier D - Area (Ref. 1, p. 51591, Section 2.4.2.1.5).

Source Hazardous Waste Quantity Value: 4,948

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

Number of the source: 2

Name and description of the source: Slag Waste Pile – Western Jetty of Cheesequake Creek Inlet

Source Type: Pile

Source 2 consists of the western jetty of the Cheesequake Creek Inlet, which extends into Raritan Bay. The source also includes slag materials extending west from the jetty along the southern shoreline of Raritan Bay (Ref. 4, Figures 1and 2; 9, p. 5). During field activities conducted by EPA in September 2008, the western jetty of the Cheesequake Creek Inlet was noted to contain slag material similar to that deposited along the Laurence Harbor seawall (i.e., Source 1). Battery casing fragments were also noted on the jetty (Ref. 16, p. 1). During field activities, the Raritan Bay was observed to come in direct contact with the slag contained within the western jetty of the Cheesequake Creek Inlet during high tide (Ref. 9, pp. 2, 7, 8; 16, p. 1).

In September 2008, EPA conducted a sampling investigation of the site. Waste/soil samples were collected from the western jetty of the Cheesequake Creek Inlet (Ref. 17, pp. 5, 7, 8, Figure 2; 9, pp. 14-16, 24; 16, p. 1). Selected samples were analyzed for TCLP metals (Ref. 17, pp. 1, 13). Analytical results from samples collected from the western jetty indicated the presence of lead at concentrations above the RCRA regulatory level of 5 mg/L (Ref. 17, pp. 5, 7, 8, 13, Figure 2; 18, pp. 2-6; 20, p. 5).

Location of the source, with reference to a map of the site:

The slag waste pile composing the western jetty of the Cheesequake Creek Inlet (i.e., Source 2) is located at the discharge point of Cheesequake Creek into Raritan Bay (Ref. 4, Figures 1 and 2; 9, pp. 2, 5).

Containment

Release to surface water via overland migration and/or flood:

Based on observations made during field activities conducted by EPA in September 2008, there are no containment features associated with the western jetty of the Cheesequake Creek Inlet. No maintained engineered cover, a liner or a run-on control system and runoff management system were observed (Ref. 16, p. 1). In addition, slag materials from the jetty were observed to be in direct contact with Raritan Bay during high tide, resulting in the source being located in surface water (Ref. 9, pp. 2, 7, 8; 16, p. 1). Analytical results from the TCLP samples collected from western jetty of the Cheesequake Creek Inlet indicate that lead in the waste is likely to migrate from the source. Based on an evaluation of the above conditions, an overland flow containment factor of 10 is assigned (Ref. 1, p. 51609).

Release to surface water via flood:

During field activities conducted by EPA in September 2008, no features were observed which would suggest that containment at the western jetty of the Cheesequake Creek Inlet is designed, constructed, operated, and maintained to prevent a washout of hazardous substances by flood (Ref. 16, p. 1). Therefore, a flood containment factor of 10 is assigned (Ref. 1, p. 51611).

2.4.1 Hazardous Substances

In September 2008, EPA conducted a sampling investigation of the site. Soil samples were collected directly from the western jetty of the Cheesequake Creek Inlet as well as from areas of slag deposits located immediately west of the jetty along the Raritan Bay's southern shoreline (Ref. 17, pp. 5, 7, 8, Figure 2). Waste/soil samples were collected and submitted for TCLP metals and mercury analyses; leachate from these samples was generated by EPA Method SW-846 1311 (i.e., TCLP) as modified in Modification Reference Number 1454.1 (Ref. 9, pp. 14-16, 24; 17, p. 13; 18, pp. 28, 29). The leachate was then analyzed using Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) as per Contract Laboratory Program (CLP) Inorganic Statement of Work (SOW) ILM05.4 (Ref. 18, pp. 28, 29). Analytical results from samples collected in these areas indicated the presence of lead at concentrations above the RCRA regulatory level of 5 milligrams per liter (mg/L) (Ref. 17, pp. 5, 7, 8, 13, Figure 2; 18, pp. 2-6; 20, p. 5).

Hazardous Substance	Evidence	Reference(s)
Lead	TCLP soil samples, EPA, September 2008:	
	S07A (930,000 ug/L)	17, pp. 5, 13, 16, 49; 18, p. 2
	S97 (561,000 ug/L)	17, pp. 8, 13_16, 51; 18, p. 5
	S98 (1,230,000 ug/L)	17, pp. 8, 13, 16, 52; 18, p. 6
	S59A (10,300 ug/L)	17, pp. 7, 13, 16, 53; 18, p. 3
	S60A (723,000 ug/L)	17, pp. 7, 13, 16, 53; 18, p. 4

Notes:

ug/L – micrograms per liter

Sample concentrations in parentheses

RCRA regulatory level for lead is 5 milligrams per liter (i.e., 5,000 ug/L) (Ref. 20, p. 5)

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to evaluate Tier A source hazardous waste quantity; therefore, hazardous constituent quantity is not scored (NS).

Hazardous Constituent Quantity (C) Value: NS

2.4.2.1.2 Hazardous Wastestream Quantity

The information available is not sufficient to evaluate Tier B source hazardous waste quantity; therefore, hazardous wastestream quantity is not scored.

Hazardous Wastestream Quantity (W) Value: NS

2.4.2.1.3 Volume

The information available is not sufficient to evaluate Tier C source hazardous waste quantity; therefore, volume (V) is assigned a value of 0 (Ref. 1, p. 51591, Section 2.4.2.1.3).

Volume (V) Value: 0

2.4.2.1.4 Area

Source 2 is a waste pile containing lead-contaminated slag which composes the western jetty of the Cheesequake Creek Inlet (Ref. 4, Figures 1 and 2; 9, pp. 2, 5). This source is characterized by the presence of slag materials within the western jetty of the Cheesequake Creek Inlet and the shoreline of the Raritan Bay immediately west of the jetty (Ref. 4, p. 2). Based on analytical results from samples collected from the EPA sampling event in September 2008, it is apparent that lead contamination is present (Ref. 17, pp. 5, 7, 8, Figure 2; 18, pp. 2, 3, 4, 5, 6; 20, p. 5). The estimated land surface area under the pile is 29,690 square feet (ft^2) (Ref. 4, Figure 2; 11, p. 1). The source type is Pile, so the area value is divided by 13 to obtain the assigned value, as shown below (Ref. 1, p. 51591, Section 2.4.2.1.4, Table 2-5).

Area of source (ft^2): 29,690

Area (A) Assigned Value: (29,690)/(13) = 2,283.84

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source hazardous waste quantity value for Source 2 is 2,283.84 for Tier D - Area (Ref. 1, p. 51591, Section 2.4.2.1.5).

Source Hazardous Waste Quantity Value: 2,283.84

SITE SUMMARY OF SOURCE DESCRIPTIONS

Source Number	Source Hazardous Waste Quantity Value	Containment			
		Ground Water	Surface Water	Air Gas	Air Particulate
1	4,948	NS	10*	NS	NS
2	2,283.84	NS	10*	NS	NS

NS = Not Scored

* Overland flow containment and flood containment factors are 10 for all sources.

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

4.1.1.1 Definition of Hazardous Substance Migration Path for Overland/Flood Component

The site consists of two source areas located within one watershed (i.e., Raritan Bay). Both sources are located along the southern shoreline of the Raritan Bay (Ref. 4, Figures 1 and 2; 9, p. 5). The sources being evaluated under this package consist of waste piles associated with the Laurence Harbor seawall (i.e., Source 1), and the western jetty of the Cheesequake Creek Inlet (i.e., Source 2). The sources are located along the southern shoreline of Raritan Bay; approximately 0.8 mile of shoreline separates the sources. Although these sources are separated, the sources have overlapping target distance limits (Ref 4, Figure 3). Based on analytical data from the EPA sampling investigation conducted in September 2008, it is evident that releases of lead from both waste sources are impacting the watershed simultaneously. The Raritan Bay is tidally influenced in the area of both sources, with tidal cycles occurring approximately every 6 hours (Ref. 9, pp. 16-29; 10, pp. 1-2; 16, p. 1). Salinity measurements for Raritan Bay indicated a brackish water environment in the areas of the Laurence Harbor Seawall and the western jetty of the Cheesequake Creek Inlet (Ref. 9, p. 6). Presented below is information related to each waste source, including the probable point of entry from each source to surface water and surface water targets surface water targets impacted by each source.

Source 1 – Laurence Harbor Seawall

The PPE to surface water from Source 1 (i.e., PPE1) is represented by the interface between the Raritan Bay and the slag materials associated with the Laurence Harbor seawall, which extends along the southern shoreline of Raritan Bay between Laurence Parkway and Margaret's Creek (Ref. 9, pp. 4, 5, 10, 11, 12; 16, p. 1).

Based on analytical data from the September 2008 sampling investigation, there is an observed release of lead, by direct observation and chemical analysis, from Source 1 to the Raritan Bay. The Raritan Bay is considered a fishery at the Laurence Harbor seawall. Species fished for consumption in the immediate area of the seawall include striped bass and blue fish (Ref. 9, pp. 3, 4, 5). The annual production of fish taken from Raritan Bay is unknown but estimated to be greater than 0. The Raritan Bay is part of the New York-New Jersey Estuary, which is a sensitive area identified under the National Estuary Program (Ref. 13, pp. 1-11). Raritan Bay is also classified by NJDEP as a Class FW2-NT/SE1 surface water at the Laurence Harbor seawall; this connotes an area for the protection and maintenance of aquatic life (Ref. 14, pp. 1-13).

Source 2 – Western Jetty of the Cheesequake Creek Inlet

The PPE to surface water from Source 2 (i.e., PPE2) is represented by the interface between the Raritan Bay and the slag materials associated with the western jetty of the Cheesequake Creek Inlet, and the attached slag materials extending west along the southern shoreline of Raritan Bay. Slag portions of this jetty were also observed to be in direct contact with Raritan Bay (Ref. 9, pp. 2, 7, 8; 16, p. 1).

Based on analytical data from the September 2008 sampling investigation, there is an observed release of lead, by direct observation and chemical analysis, from Source 2 to the Raritan Bay. Raritan Bay is considered a fishery at the western jetty of the Cheesequake Creek Inlet. Species fished for consumption in the area of the jetty include striped bass and blue fish (Ref. 9, pp. 3, 4, 5). The annual production of fish taken from Raritan Bay is unknown but estimated to be greater than 0. The Raritan Bay is part of the New York-New Jersey Estuary, which is a sensitive area identified under the National Estuary Program (Ref. 13, pp. 1-11). Raritan Bay is also classified by NJDEP as a Class FW2-NT/SE1 surface water at the jetty; this connotes an area for the protection and maintenance of aquatic life (Ref. 14, pp. 1-13).

Since there are observed releases from each source to the Raritan Bay by direct observation and chemical analysis, source-specific scoresheets were generated in the evaluation of this site. These source-specific scoresheets, on a line by line basis, refer to the relevant page in the HRS documentation record where the values were determined. Since observed releases to surface water from both sources has resulted in the maximum score for the surface water migration pathway, potential targets were not scored. Individual score sheets for each waste source are presented in Appendix A.

4.1.2.1 Likelihood of Release

4.1.2.1.1 Observed Release

Based on analytical data from the EPA sampling investigation conducted in September 2008, there are observed releases to the Raritan Bay from each source (i.e., Source 1 and Source 2). Observed releases from each source are documented via direct observation and chemical analysis.

Direct Observation by Direct Contact

Basis for Direct Observation – Source 1 (Laurence Harbor Seawall)

During the EPA sampling investigation conducted in September 2008, several portions of the Laurence Harbor seawall were observed to consist of slag materials. Battery casing fragments were also noted within the materials in the seawall (Ref 9, p. 4). During field activities, the Raritan Bay was observed to come in contact with the slag materials associated with the Laurence Seawall during high tide (Ref. 9, pp. 4, 5, 10, 11, 12; 16, p. 1).

Analytical results of leachate from waste/soil samples collected from the Laurence Harbor seawall (analyzed for TCLP metals) indicated the presence of lead at concentrations above the RCRA regulatory level of 5 milligrams per liter (mg/L). Specifically, waste/samples RBS-S01A, RBS-S02A, and RBS-S03A exceeded the RCRA regulatory limit for lead (Ref. 17, pp. 5, 13; 18, pp. 7-9; 20, p. 5). Sample locations RBS-S01A and S03A were observed to be submerged in Raritan Bay during high tide on 16 January 2009 (Ref. 9, pp. 13, 15, 16, 23).

Basis for Direct Observation – Source 2 (Western Jetty - Cheesequake Creek Inlet)

During the EPA sampling investigation conducted in September 2008, the top portion of the western jetty of the Cheesequake Creek Inlet was observed to consist of slag materials. The southern shoreline of the Raritan Bay extending west from the jetty was also observed to consist of slag materials (Ref. 9, p. 18). During field activities, the Raritan Bay was observed to come in contact with the slag materials associated with the western jetty of the Cheesequake Creek Inlet during high tide. (Ref. 9, pp. 2, 3, 7, 8; 16, p. 1).

Analytical results of leachate from waste/soil samples collected from the Laurence Harbor Seawall (analyzed for TCLP metals) indicated the presence of lead at concentrations above the RCRA regulatory level of 5 milligrams per liter (mg/L) (Ref. 20, p. 5). Specifically, waste/soil samples RBS-S07A, RBS-S97, RBS-S98, RBS-S59A, and RBS-60A exceeded the regulatory limit for lead (Ref. 17, pp. 5, 7, 8, 13; 18, pp. 2-6). Sample locations RBS-S07A, RBS-S59A, and RBS-S60A were observed to be submerged within Raritan Bay during high tide on 16 January 2009 (Ref. 9, pp. 13, 15-17, 24, 25).

Chemical Analysis

Based on analytical results from sediment samples collected during the EPA sampling investigation conducted in September 2008, there are observed releases by chemical analyses to surface water from Source 1 (i.e., Laurence Harbor seawall) and Source 2 (western jetty of Cheesequake Creek Inlet). A discussion of observed releases from each source is presented below:

Source 1 – Laurence Harbor Seawall

Sediment samples collected by EPA in September 2008 indicate an observed release by chemical analysis to the surface water pathway. Sediment samples collected from Raritan Bay adjacent to the Laurence Harbor Seawall indicated concentrations (greater than three times the background concentrations) of lead (Ref. 17, pp. 8-12, Figure 2; 22, pp. 6, 7, 9-12, 15, 57-61, 64, 65; 23, pp. 30-39, 63, 64, 65; 24, pp. 2-13). Sediment samples were analyzed for Target Analyte List (TAL) metals and grain size (Ref. 17, p. 1). The resulting analytical data were validated according to EPA Region 2 Data Validation Standard Operating Procedures (SOP) (Ref. 22, pp. 70-77; 23, pp. 74-80; 24, pp. 63-72). Background sediment samples were collected from the Raritan Bay from locations east and west of the Laurence Harbor seawall (Ref. 17, Figure 2).

Sample Similarity:

Background and release samples were collected for the same analytical parameters within the same timeframe (i.e., September 2008), from identical depths (i.e., 0-3 inches) and from the same body of water (i.e., Raritan Bay) (Ref. 17, pp. 1, 8-12, Figure 2). In addition, the background and release sediment samples listed consisted of mostly course-grained materials (i.e., sands and gravels) with little organic materials (i.e., silt and clay) (Ref. 26, pp. 10-21, 38, 40-42, 45, 46, 108, 109, 111, 158-173). Due to the similarities between background and release samples, the analytical results are considered to be similar for the purpose of this HRS Documentation Record.

Source 2 – Western Jetty of Cheesequake Creek Inlet

Sediment samples collected by EPA in September 2008 indicate an observed release by chemical analysis to the surface water pathway. Sediment samples collected from Raritan Bay adjacent to western jetty of the Cheesequake Creek Inlet indicated concentrations (greater than three times the background concentrations) of lead (Ref. 17, pp. 10-12; 23, pp. 31, 63-65; 25, pp. 8-12, 15, 16). Sediment samples were analyzed for Target Analyte List (TAL) metals and grain size (Ref. 17, p. 1). The resulting analytical data were validated according to EPA Region 2 Data Validation Standard Operating Procedures (SOP) (Ref. 23, pp. 74-80; 25, pp. 70-78). Background sediment samples were collected from the Raritan Bay from locations east and west of the western jetty of the Cheesequake Creek Inlet (Ref. 17, Figure 2).

Sample Similarity:

Background and release samples were collected for the same analytical parameters within the same timeframe (i.e., September 2008), from identical depths (i.e., 0-3 inches) and from the same body of water (i.e., Raritan Bay) (Ref. 17, pp. 1, 8-12, Figure 2). Background samples RBS-SED84, RBS-SED85, RBS-SED86, RBS-SED52, and RBS-SED 64 are similar to release sediment samples RBS-SED58 and RBS-SED60 since these samples consisted of mostly course-grained materials (i.e., sands and gravels) with little organic materials (i.e., silt and clay). In addition, background sample RBS-SED63 is similar to release samples RBS-SED56, RBS-SED57 and RBS-SED59 since these samples consisted of higher percentages of silt and clay (Ref. 26, pp. 68-72, 74, 75, 107-110, 184, 185). Due to the similarities between background and release samples, the analytical results are considered to be similar for the purpose of this HRS Documentation Record.

Hazardous Substances in the Release (Chemical Analysis)

Background Concentrations (Source 1 – Laurence Harbor Seawall)

Sample ID	Sampling Location	Depth	Date	Reference(s)
RBS-SED01	Raritan Bay, east of Laurence Harbor Seawall	0 to 3 inches	9/10/08	17, p. 8, Figure 2
RBS-SED02	Raritan Bay, east of Laurence Harbor Seawall	0 to 3 inches	9/10/08	17, p. 8, Figure 2
RBS-SED13	Raritan Bay, east of Laurence Harbor Seawall	0 to 3 inches	9/10/08	17, p. 9, Figure 2
RBS-SED84	Raritan Bay, west of Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 11, Figure 2
RBS-SED85	Raritan Bay, west of Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 11, Figure 2

Sample ID	Hazardous Substance	Conc (mg/kg)	Adjusted CRQL (mg/kg) *	Reference(s)
RBS – SED01	Lead	9.2 J (9.2)	1.23	17, p. 8, 16, 64; 22, p. 6; 21, pp. 2, 7, 39, 40; 28, pp. 1-2
RBS – SED02	Lead	7.3 J (7.3)	1.24	17, p. 8, 16, 64; 22, p. 7; 21, pp. 2, 7, 39, 40; 28, pp. 1-2
RBS – SED13	Lead	11.5 J (11.5)	1.24	17, p. 9, 16, 65; 22, p. 12; 21, pp. 2, 8, 39, 40; 28, pp. 1-2
RBS – SED84	Lead	2.1	1.23	17, p. 11, 16, 40; 23, p. 64; 21, pp. 2, 10, 22, 24
RBS – SED85	Lead	2.4	1.18	17, p. 11, 16, 40; 23, p. 65; 21, pp. 2, 10, 22, 24

J – Estimated concentration; if required , adjusted concentration in parentheses (Ref. 28, pp. 1-2; 29, pp. 1-18)

* Contract-Required Quantitation Limit, adjusted to account for percent solids (Ref. 21, p. 1)

Contaminated Samples (Source 1 – Laurence Harbor Seawall)

Since the highest background sample concentration is 11.5 mg/kg, sediment samples with lead concentrations significantly (i.e., greater than 3 times) above the highest background sample concentration were considered contaminated. Therefore, sediment samples with concentrations (or adjusted qualified sample concentrations) greater than 34.5 mg/kg, were included as contaminated samples:

Sample ID	Sampling Location	Depth	Date	Reference(s)
RBS-SED04	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/10/08	17, p. 8, Figure 2
RBS-SED05	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/10/08	17, p. 8, Figure 2
RBS-SED06	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/10/08	17, p. 8, Figure 2
RBS-SED07	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 8, Figure 2
RBS-SED16	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/10/08	17, p. 9, Figure 2
RBS-SED17	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED18	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED08	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 8, Figure 2
RBS-SED19	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED09	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED20	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED10	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9; Figure 2

Sample ID	Sampling Location	Depth	Date	Reference(s)
RBS-SED11	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED21	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 8, Figure 2
RBS-SED22	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED23	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED12	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED24	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED26	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED25	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED81	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/11/08	17, p. 11, Figure 2
RBS-SED82	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/11/08	17, p. 11, Figure 2
RBS-SED83	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/11/08	17, p. 11, Figure 2
RBS-SED87	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 12, Figure 2
RBS-SED88	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 12, Figure 2
RBS-SED33	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 10, Figure 2
RBS-SED34	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 10, Figure 2
RBS-SED35	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 10, Figure 2
RBS-SED30	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED31	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED32	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED27	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED28	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2
RBS-SED29	Raritan Bay, near Laurence Harbor Seawall	0 to 3 inches	9/12/08	17, p. 9, Figure 2

Sample ID	Hazardous Substance	Conc (mg/kg)	Adjusted CRQL(mg/kg) *	Reference(s)
RBS-SED04	Lead	60.9 J (42.29)	1.34	17, p. 8, 16, 64; 22, p. 9; 21, pp. 2, 7, 39, 40; 28, pp. 1-2
RBS-SED05	Lead	135 J (93.75)	1.35	17, p. 8, 16, 64; 22, p. 10; 21, pp. 2, 7, 39, 40; 28, pp. 1-2
RBS-SED06	Lead	252 J (175)	1.33	17, p. 8, 16, 64; 22, p. 11; 21, pp. 2, 7, 39, 40; 28, pp. 1-2
RBS-SED07	Lead	5,860	3.33	17, p. 8, 16, 41; 23, p. 30; 21, pp. 2, 7, 17, 18
RBS-SED16	Lead	107 J (74.3)	1.29	17, p. 9, 16, 65; 22, p. 15; 21, pp. 2, 8, 39, 40; 28, pp. 1-2
RBS-SED17	Lead	75.7	1.42	17, p. 9, 16, 42; 23, p. 36; 21, pp. 2, 8, 17, 18
RBS-SED18	Lead	186	1.60	17, p. 9, 16, 42; 23, p. 37; 21, pp. 2, 8, 17, 19
RBS-SED08	Lead	861	1.29	17, p. 8, 16, 41; 23, p. 31; 21, pp. 2, 7, 17, 18
RBS-SED19	Lead	93.5	1.50	17, p. 9, 16, 42; 23, p. 38; 21, pp. 2, 8, 17, 19
RBS-SED09	Lead	403	1.23	17, p. 9, 16, 41; 23, p. 32; 21, pp. 2, 8, 17, 18
RBS-SED20	Lead	58.2	1.52	17, p. 9, 16, 42; 23, p. 39; 21, pp. 2, 8, 17-19
RBS-SED10	Lead	326	1.24	17, p. 9, 41, Figure 2; 23, p. 33; 21, pp. 2, 8, 17, 18

Sample ID	Hazardous Substance	Conc (mg/kg)	Adjusted CRQL(mg/kg) *	Reference(s)
RBS-SED11	Lead	441	1.41	17, p. 9, 16, 41; 23, p. 34; 21, pp. 2, 8, 17, 18
RBS-SED21	Lead	48.1	1.31	17, p. 9, 16, 42; 23, p. 40; 21, pp. 2, 8, 17, 19
RBS-SED22	Lead	53.6 J (37.2)	1.29	17, p. 9, 16, 43; 22, p. 57; 21, pp. 2, 8, 53, 54; 28, pp. 1-2
RBS-SED23	Lead	90.7 J (63)	1.43	17, p. 9, 16, 43; 22, p. 58; 21, pp. 2, 8, 53, 54; 28, pp. 1-2
RBS-SED12	Lead	660	1.20	17, p. 9, 16, 42; 23, p. 35; 21, pp. 2, 8, 17, 18
RBS-SED24	Lead	79.4 J (55.1)	1.38	17, p. 9, 16, 43; 22, p. 59; 21, pp. 2, 8, 53, 54; 28, pp. 1-2
RBS-SED26	Lead	525 J (364.6)	1.39	17, p. 9, 16, 43; 22, p. 61; 21, pp. 2, 8, 53, 54; 28, pp. 1-2
RBS-SED25	Lead	458 J (318)	1.17	17, p. 9, 16, 43; 22, p. 60; 21, pp. 2, 8, 53, 54; 28, pp. 1-2
RBS-SED81	Lead	463	1.27	17, p. 11, 16, 31; 24, p. 11; 21, pp. 2, 10, 56, 57
RBS-SED82	Lead	422	1.39	17, p. 11, 16, 31; 24, p. 12; 21, pp. 2, 10, 56, 57
RBS-SED83	Lead	318	1.31	17, p. 11, 16, 32; 24, p. 13; 21, pp. 2, 10, 56, 58
RBS-SED87	Lead	1,110 J (763.9)	1.27	17, p. 12, 16, 43; 22, p. 64; 21, pp. 2, 11, 53, 54; 28, pp. 1-2
RBS-SED88	Lead	1,440 J (1,000)	1.40	17, p. 12, 16, 43; 22, p. 65; 21, pp. 2, 11, 53, 54; 28, pp. 1-2
RBS-SED33	Lead	533	1.18	17, p. 10, 16, 31; 24, p. 8; 21, pp. 2, 9, 56, 57
RBS-SED34	Lead	307	1.45	17, p. 10, 16, 31; 24, p. 9; 21, pp. 2, 9, 56, 57
RBS-SED35	Lead	304	1.46	17, p. 10, 16, 31; 24, p. 10; 21, pp. 2, 9, 56, 57
RBS-SED30	Lead	530	1.16	17, p. 9, 16, 31; 24, p. 5; 21, pp. 2, 8, 56, 57
RBS-SED31	Lead	280	1.45	17, p. 9, 16, 31; 24, p. 6; 21, pp. 2, 8, 56.57
RBS-SED32	Lead	318	1.43	17, p. 9, 16, 31; 24, p. 7; 21, pp. 2, 8, 56, 57
RBS-SED27	Lead	311	1.24	17, p. 9, 16, 31; 24, p. 2; 21, pp. 2, 8, 56. 57
RBS-SED28	Lead	394	1.38	17, p. 9, 16, 31; 24, p. 3; 21, pp. 2, 8, 56, 57
RBS-SED29	Lead	200	1.30	17, p. 9, 16, 31; 24, p. 4; 21, pp. 2, 8, 56, 57

J – Estimated concentration; if required, adjusted concentration in parentheses (Ref. 28, pp. 1, 2; 29, pp. 1-18)

* Contract-Required Quantitation Limit, adjusted to account for percent solids (Ref. 21, p. 1)

Background Concentrations (Source 2 – Western Jetty of Cheesequake Creek Inlet)

Sample ID	Sampling Location	Depth	Date	Reference(s)
RBS-SED84	Raritan Bay, east of western jetty	0 to 3 inches	9/12/08	17, p. 11, Figure 2
RBS-SED85	Raritan Bay, east of western jetty	0 to 3 inches	9/12/08	17, p. 11, Figure 2
RBS-SED86	Raritan Bay, east of western jetty	0 to 3 inches	9/12/08	17, p. 11, Figure 2
RBS-SED52	Raritan Bay, east of western jetty	0 to 3 inches	9/12/08	17, p. 10, Figure 2
RBS-SED63	Raritan Bay, west of western jetty	0 to 3 inches	9/15/08	17, p. 11, Figure 2
RBS-SED64	Raritan Bay, west of western jetty	0 to 3 inches	9/15/08	17, p. 11, Figure 2

Sample ID	Hazardous Substance	Conc (mg/kg)	Adjusted CRQL (mg/kg) *	Reference(s)
RBS – SED84	Lead	2.1	1.23	17, p. 11, 16, 40; 23, p. 64; 21, pp. 2, 10, 22, 24
RBS – SED85	Lead	2.4	1.18	17, p. 11, 16, 40; 23, p. 65; 21, pp. 2, 10 22, 24
RBS – SED86	Lead	7.3	1.23	17, p. 11, 16, 42; 23, p. 31; 21, pp. 2, 10, 17, 19
RBS – SED52	Lead	2.3	1.15	17, p. 10, 16, 40; 23, p. 63; 21, pp. 3, 9, 22, 23
RBS – SED63	Lead	36.3	1.36	17, p. 11, 16, 53; 25, p. 15; 21, pp. 3, 10, 27, 29
RBS – SED64	Lead	29.6	1.37	17, p. 11, 16, 53; 25, p. 16; 21, pp. 3, 10, 27, 29

* CRQL - Contract-Required Quantitation Limit, adjusted to account for percent solids (Ref. 21, p. 1)

Contaminated Samples (Source 2 – Western Jetty of Cheesequake Creek Inlet)

Since the highest background sample concentration is 36.3 mg/kg, sediment samples with lead concentrations significantly (i.e., greater than 3 times) above the highest background sample concentration were considered contaminated. Therefore, sediment samples with concentrations (or adjusted qualified sample concentrations) greater than 108 mg/kg, were included as contaminated samples:

Sample ID	Sampling Location	Depth	Date	Reference(s)
RBS-SED56	Raritan Bay, adjacent to western jetty	0 to 3 inches	9/15/08	17, p. 10, Figure 2
RBS-SED57	Raritan Bay, adjacent to western jetty	0 to 3 inches	9/15/08	17, p. 11, Figure 2
RBS-SED58	Raritan Bay, adjacent to western jetty	0 to 3 inches	9/15/08	17, p. 11, Figure 2
RBS-SED59	Raritan Bay, adjacent to western jetty	0 to 3 inches	9/15/08	17, p. 11, Figure 2
RBS-SED60	Raritan Bay, adjacent to western jetty	0 to 3 inches	9/15/08	17, p. 11, Figure 2

Sample ID	Hazardous Substance	Conc (mg/kg)	Adjusted CRQL (mg/kg) *	Reference(s)
RBS – SED56	Lead	1,770 J (1,770)	9.62	17, p. 10, 16, 41; 25, p. 8; 21, pp. 3, 9, 27, 28; 28, pp. 1-2
RBS – SED57	Lead	2,150	1.92	17, p. 11, 16, 41; 25, p. 9; 21, pp. 3, 10, 27, 28
RBS – SED58	Lead	542	1.66	17, p. 11, 16, 41; 25, p. 10; 21, pp. 3, 10, 27, 28
RBS – SED59	Lead	251 J (251)	2.13	17, p. 11, 16, 53; 25, p. 11; 21, pp. 3, 10, 27, 28; 28, pp. 1-2
RBS – SED60	Lead	197	1.75	17, p. 11, 16, 53; 25, p. 12; 21, pp. 3, 10, 27, 28

J – Estimated concentration; if required, adjusted concentration in parentheses (Ref. 28, pp. 1, 2; 29, pp. 1-18)
* CRQL - Contract-Required Quantitation Limit, adjusted to account for percent solids (Ref. 21, p. 1)

Attribution (chemical analysis):

Source 1 – Laurence Harbor Seawall

Background information indicates that in September 1972, NJDEP was advised by a local government official that lead-bearing waste material was being disposed of along the Laurence Harbor beachfront on Raritan Bay. NJDEP background information indicates that by a letter from NL Industries, Inc. (NL) to NJDEP (dated December 1972), NL acknowledged that slag consisting of non-recoverable low yield metallic waste from blast furnace and blast furnace rubble are disposed of by Liberty Trucking Company at their property in Madison Township, Route 35, New Jersey. Madison Township is currently known as Old Bridge Township. NL used battery plates from lead/acid storage batteries as the principal feed material for the blast furnace located at its plant in Perth Amboy, New Jersey (Ref. 7, pp. 2).

On May 23, 2007 and July 24, 2007, NJDEP conducted soil sampling events along the southern shoreline of the Raritan Bay adjacent to the Old Bridge Waterfront Park. Analytical results from these sampling events indicated the presence of lead at concentrations as high as 142,000 parts per million, which is above the state's unrestricted use and restricted use Soil Cleanup Criteria (Ref. 7, p. 2; 8, pp. 1-57). NJDEP described the waste material associated with the Laurence Harbor seawall as consisting of various materials including large pieces of rust-colored slag. Other waste (i.e., slag) materials associated with the low-yield metallic waste from blast furnace and blast furnace rubble included finer grained "nuggets" as well as battery casing fragments of various sizes. NJDEP officials stated that it is possible that some of the finer waste materials comprising the Laurence Harbor Seawall may have been included in the soil samples (Ref. 15, p. 1).

Based on TCLP results for lead in waste samples collected from the Laurence Harbor seawall, and lead concentrations being detected in sediment samples at concentrations significantly above concentrations detected in background samples located east and west of the seawall, it is evident that the Raritan Bay is being impacted by slag deposits associated with the Laurence Harbor seawall. (See Section 2.4.1, p. 13, and Section 4.1.2.1.1, p. 20 of this documentation record.)

Source 2 – Western Jetty of Cheesequake Creek Inlet

During field activities conducted by EPA in September 2008, the western jetty of the Cheesequake Creek Inlet was noted to contain slag material similar to that deposited along the Laurence Harbor seawall (i.e., Source 1). Battery casing fragments were also noted on the jetty (Ref. 16, p. 1). During field activities, the Raritan Bay was observed to come in direct contact with the slag contained within the western jetty of the Cheesequake Creek Inlet during high tide (Ref. 9, pp. 2, 4, 7, 8; 16, p. 1).

Based on TCLP results for lead in waste samples collected from the western jetty of the Cheesequake Creek Inlet, and lead concentrations being detected at concentrations significantly above concentrations detected in background sediment samples collected from Raritan Bay at locations east and west of the jetty, it is evident that Raritan Bay is being impacted

by releases of lead associated with the western jetty of the Cheesequake Creek Inlet. (See Section 2.4.1, p. 16, and Section 4.1.2.1.1, p. 20, of this documentation record.)

Hazardous Substances Released (Source 1):

Lead (by direct observation and chemical analyses)

Hazardous Substances Released (Source 2):

Lead (by direct observation and chemical analyses)

==========

Observed Release Factor Value: 550

4.1.2.2 WASTE CHARACTERISTICS

4.1.2.2.1 Toxicity/Persistence

Hazardous Substance*	Source No.	Toxicity Factor Value	Persistence** Factor Value	Toxicity/ Persistence Factor Value (Table 4-12)	Reference
Lead	1, 2 OR	10,000	1	10,000	2, p. BI-8

OR – Observed Release

* Lead is documented in the observed releases by direct observation and chemical analysis.
** The persistence factor value for Rivers also applies to coastal tidal waters. See HRS Table 4-10 and HRS Section 4.1.2.2.1.2 (Ref. 1, p. 51612).

==========

Toxicity/Persistence Factor Value: 10,000

4.1.2.2.2 Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity (HWQ) Value (Section 2.4.2.1.5.)	Is source hazardous constituent quantity data complete? (yes/no)
1	4,948	no
2	2,283,84	no
Sum of Values:	7,232	

(rounded to nearest integer as specified in HRS Section 2.4.2.2 [Ref. 1, p. 51591])

The sum of values for source hazardous waste quantity factor values as determined in Section 2.4.2.2 of the documentation record corresponds to a value of 100 in Table 2-6 of the HRS (Ref. 1, p. 51591). In addition, since surface water targets are subject to Level II contamination, then either the value of Table 2-6 or a value of 100 is assigned, whichever is greater (Ref. 1, p. 51592). Therefore, the hazardous waste quantity factor value of 100 is assigned.

4.1.2.2.3 Waste Characteristics Factor Category Value

One hazardous substance (i.e., lead) associated with waste sources that have a surface water pathway containment factor greater than 0 for the Raritan Bay watershed corresponds to the maximum toxicity/persistence factor value (10,000) (Ref. 1, pp. 51613, 51617; Section 4.1.2.2.1 Toxicity/Persistence of this HRS documentation record).

Toxicity/persistence factor value
X hazardous waste quantity factor value = 10,000 x 100 = $1x10^6$

The product corresponds to the Waste Characteristics Factor Category Value of 32 in Table 2-7 of the HRS (Ref. 1, pp. 51592).

==========

Hazardous Waste Quantity Factor Value: 100
Waste Characteristics Factor Category Value: 32

4.1.2.3 **DRINKING WATER TARGETS**

Level I Concentrations

Sample ID: Not Applicable (N/A)
Sample Medium: N/A
Location: N/A
Reference: N/A

Hazardous Substance	Hazardous Substance Concentration	Benchmark Concentration	Benchmark
N/A	N/A	N/A	N/A

Reference for Benchmarks:

Most Distant Level I Sample

Sample ID: N/A
Distance from the probable point of entry: N/A
Reference: N/A

Most Distant Level II Sample

Sample ID: N/A
Distance from the probable point of entry: N/A
Reference: N/A

4.1.2.3.1 Nearest Intake

Location of Nearest Drinking Water Intake: None
Distance from the probable point of entry: N/A
Reference: N/A

Potential Contamination:

Type of surface water body: N/A

Dilution Weight: NA

==========

Nearest Intake Factor Value: Not Scored (NS)

4.1.2.3.2 **Population**

4.1.2.3.2.2 Level I Concentration

Intake	Distance Along the In-water Segment from the Probable Point of Entry	Population	References
Not Scored	N/A	N/A	N/A

==========

Population Served by Level I Intakes:

Level I Population Factor Value: NS

4.1.2.3.2.3 Level II Concentration

Intake	Distance Along the In-water Segment from the Probable Point of Entry	Population	References
Not Scored	N/A	N/A	N/A

==========

Level II Population Factor Value: NS

4.1.2.3.2.4 Potential Contamination

Since a maximum score of 100.00 was achieved for the surface water migration pathway, potential contamination was not scored for the Drinking Water component.

Intake	Average Annual Flow (cfs)	Population Served	References
N/A	N/A	N/A	N/A

Type of Surface Water Body	Total Population	Dilution-Weighted Population (Table 4-14)
N/A	N/A	N/A

==========

Dilution-Weighted Population Served by Potentially Contaminated Intakes:

Potential Contamination Factor Value: NS

4.1.2.3.3 **Resources**

HRS section 4.1.2.3.3 describes the evaluation of resources associated with impacted watersheds. The in- water segment of Raritan Bay adjacent to Old Bridge Waterfront Park qualifies as a major or designated water recreation area, excluding drinking water use (Ref 1, p. 51617). Old Bridge Waterfront Park extends from Cheesequake Creek to Margaret's Creek (Ref. 19, p. 1). Middlesex County has designated Old Bridge Waterfront Park as a water recreation area, appropriate for fishing activities; additionally, fishing and swimming activities were observed in Raritan Bay within the Old Bridge Waterfront Park, which is in the immediate area of the Laurence Harbor Seawall (i.e., Source 1) and near the western jetty of the Cheesequake Creek Inlet (i.e., Source 2) (Ref. 16, p. 2; 19, pp. 1-2). Old Bridge Waterfront Park is within the in-water segment of the hazardous substance migration pathway for both sources.

==========

Resources Factor Value: 5

4.1.3.2 Human Food Chain Threat - Waste Characteristics

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

Hazardous Substance*	Source Numbers	Toxicity Factor Value	Persistence Factor Value**	Salt Water Food Chain Bioaccumulation Factor Value***	Toxicity/ Persistence/ Bioaccumulation Factor Value (Table 4-16)	Reference
Lead	1, 2 OR	10,000	1	5,000	5.0×10^7	2, p. BI-8

OR – Observed Release

* Lead is documented in the observed releases by direct observation and chemical analysis.

** The persistence factor value for Rivers also applies to coastal tidal waters. See HRS Table 4-10 and HRS Section 4.1.2.2.1.2 (Ref. 1, p. 51612).

*** Average salinity measurements for Raritan Bay collected by Weston in October 2008 during high tide indicated a brackish water environment (Ref. 9, p. 6). In accordance with Section 4.1.3.2.1.3 of Reference 1, if the fishery being evaluated is located in brackish water, the higher of the salt water or fresh water bioaccumulation potential factor values of a hazardous substance may be assigned (Ref. 1, p. 51617). Therefore, the salt water bioaccumulation potential factor for lead is assigned.

==========

Toxicity/Persistence/Bioaccumulation Factor Value: 5×10^7

4.1.3.2.2 Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity (HWQ) Value (Section 2.4.2.1.5.)	Is source hazardous constituent quantity data complete? (yes/no)
1	4,948	no
2	2,283.84	no
Sum of Values:	7,232	

(rounded to nearest integer as specified in HRS Section 2.4.2.2 [Ref. 1, p. 51591])

The sum of values for source hazardous waste quantity factor values as determined in Section 2.4.2.2 of the documentation record corresponds to a value of 100 in Table 2-6 of the HRS (Ref. 1, p. 51591). In addition, since surface water targets are subject to Level II contamination, then either the value of Table 2-6 or a value of 100 is assigned, whichever is greater (Ref. 1, p. 51592).

4.1.3.2.3 Waste Characteristics Factor Category Value

One hazardous substance (i.e., lead) associated with each source that have a surface water pathway containment factor greater than 0 for the Raritan Bay watershed corresponds to the maximum toxicity/persistence factor value (10,000) and bioaccumulation factor value (5,000), as shown previously (Ref. 1, pp. 51613; Ref. 2, p. BI-8).

(Toxicity/persistence factor value) x (hazardous waste quantity factor value) = 10,000 x 100 = 1×10^6

(Toxicity/persistence factor value x hazardous waste quantity factor value)
x (bioaccumulation potential factor value) = (1×10^6) x (5,000) = 5×10^9

The product corresponds to the Waste Characteristics Factor Category Value of 180 in Table 2-7 of the HRS (Ref. 1, pp. 51592).

Hazardous Waste Quantity Assigned Value: 100
Waste Characteristics Factor Category Value: 180

4.1.3.3 Human Food Chain Threat-Targets

Actual Food Chain Contamination

The HRS states that a fishery (or portion of a fishery) within the target distance limit of the watershed subject to actual contamination can be considered if hazardous substances have bioaccumulation potential factor values of 500 or greater and are present in the observed release to the watershed (Ref. 1, p. 51620).

In September 2008, EPA conducted a sampling investigation along the southern shoreline of the Raritan Bay adjacent to the Old Bridge Waterfront Park (i.e., Source 1) and the western jetty of the Cheesequake Creek Inlet (Source 2). Analytical results from these sampling events indicated the presence of lead at concentrations significantly above background (Ref. 17, pp. 8-12, 16; 22, pp. 6, 7, 10-12, 15, 58-61, 64, 65; 23, pp. 30-39, 63-65; 24, pp. 2-13; 25, pp. 8-12, 15, 16).

Source 1 (Laurence Harbor Seawall)

Sample ID	Hazardous Substance	Bioaccumulation Potential Factor Value	Reference
RBS-SED04	Lead	5,000	17, pp. 8, 16, 64; 22, p. 9;
RBS-SED05	Lead	5,000	17, pp. 8, 16, 64; 22, p. 10
RBS-SED06	Lead	5,000	17, pp. 8, 16, 64; 22, p. 11
RBS-SED07	Lead	5,000	17, pp. 8, 16, 41; 23, p. 30
RBS-SED16	Lead	5,000	17, pp. 9, 16, 65; 22, p. 15
RBS-SED17	Lead	5,000	17, pp. 9, 16, 42; 23, p. 36
RBS-SED18	Lead	5,000	17, pp. 9, 16, 42; 23, p. 37
RBS-SED08	Lead	5,000	17, pp. 8, 16, 41; 23, p. 31
RBS-SED19	Lead	5,000	17, pp. 9, 16, 42; 23, p. 38
RBS-SED09	Lead	5,000	17, pp. 9, 16, 41; 23, p. 32
RBS-SED20	Lead	5,000	17, pp. 9, 16, 42; 23, p. 39
RBS-SED10	Lead	5,000	17, pp. 9, 16, 41; 23, p. 33
RBS-SED11	Lead	5,000	17, pp. 9, 16, 41; 23, p. 34
RBS-SED21	Lead	5,000	17, pp. 9, 16, 42; 23, p. 40
RBS-SED22	Lead	5,000	17, pp. 9, 16, 43; 22, p. 57
RBS-SED23	Lead	5,000	17, pp. 9, 16, 43; 22, p. 58
RBS-SED12	Lead	5,000	17, pp. 9, 16, 42; 23, p. 35
RBS-SED24	Lead	5,000	17, pp. 9, 16, 43; 22, p. 59
RBS-SED26	Lead	5,000	17, pp. 9, 16, 43; 22, p. 61
RBS-SED25	Lead	5,000	17, pp. 9, 16, 43; 22, p. 60
RBS-SED81	Lead	5,000	17, pp. 11, 16, 31; 24, p. 11
RBS-SED82	Lead	5,000	17, pp. 11, 16, 31; 24, p. 12
RBS-SED83	Lead	5,000	17, pp. 11, 16, 32; 24, p. 13
RBS-SED87	Lead	5,000	17, pp. 12, 16, 43; 22, p. 64
RBS-SED88	Lead	5,000	17, pp. 12, 16, 43; 22, p. 65
RBS-SED33	Lead	5,000	17, pp. 10, 16, 31; 24, p. 8
RBS-SED34	Lead	5,000	17, pp. 10, 16, 31; 24, p. 9
RBS-SED35	Lead	5,000	17, pp. 10, 16, 31; 24, p. 10
RBS-SED30	Lead	5,000	17, pp. 9, 16, 31; 24, p. 5
RBS-SED31	Lead	5,000	17, pp. 9, 16, 31; 24, p. 6
RBS-SED32	Lead	5,000	17, pp. 9, 16, 31; 24, p. 7
RBS-SED27	Lead	5,000	17, pp. 9, 16, 31; 24, p. 2
RBS-SED28	Lead	5,000	17, pp. 9, 16, 31; 24, p. 3
RBS-SED29	Lead	5,000	17, pp. 9, 16, 31; 24, p. 4

Source 2 (Western Jetty – Cheesequake Creek Inlet)

Sample ID	Hazardous Substance	Bioaccumulation Potential Factor Value	Reference
RBS-SED56	Lead	5,000	17, pp. 10, 16, 41; 25, p. 8
RBS-SED57	Lead	5,000	17, pp. 11, 16, 41; 25, p. 9
RBS-SED58	Lead	5,000	17, pp. 11, 16, 41; 25, p. 10
RBS-SED59	Lead	5,000	17, pp. 11, 16, 53; 25, p. 11
RBS-SED60	Lead	5,000	17, pp. 11, 16, 53; 25, p. 12

Closed Fisheries

None

Benthic Tissue

None

Level I Concentrations

None

Level II Concentrations

None

Level II Fisheries

Source 1 - Raritan Bay
Source 2 - Raritan Bay

Samples for Observed Release

Source 1 – Laurence Harbor Seawall

Sample ID	Distance from PPE*	Hazardous Substance	Bioaccumulation Potential Factor Value**
S01A	0 feet	Lead	5,000
S02A	0 feet	Lead	5,000
S03A	0 feet	Lead	5,000

Source 2 – Western Jerry of Cheesequake Creek Inlet

Sample ID	Distance from PPE*	Hazardous Substance	Bioaccumulation Potential Factor Value**
S07A	0 feet	Lead	5,000
S97	0 feet	Lead	5,000
S98	0 feet	Lead	5,000
S59A	0 feet	Lead	5,000
S60A	0 feet	Lead	5,000

(Ref. 1, pp. 51617, 51618; 2, p. BI-8; 4, Figure 2; 17, pp. 5, 7, 8; 18, pp. 2-9)

* An observed release to surface water by direct observation is documented through the direct contact of the Raritan Bay with lead-contaminated slag associated with the Laurence Harbor Seawall and the western jetty of the Cheesequake Creek Inlet (Ref. 9, pp. 2, 4, 5, 7, 8, 10, 11, 12; 16, p. 1). Therefore, the distance from the PPE is evaluated as 0 feet.

** Average salinity measurements for Raritan Bay collected by Weston in October 2008 during high tide indicated a brackish water environment (Ref. 9, p. 6). In accordance with Section 4.1.3.2.1.3 of Reference 1, if the fishery being evaluated is located in brackish water, the higher of the salt water or fresh water bioaccumulation potential factor values of a hazardous substance may be assigned (Ref. 1, p. 51617). Therefore, the salt water bioaccumulation potential factor for lead is assigned.

4.1.3.3.1 Food Chain Individual

Source 1 – Laurence Harbor Seawall

Sample ID: RBS-SED09, RBS-SED10, RBS-SED11, RBS-SED12, RBS-SED19, RBS-SED20, RBS-SED21, RBS-SED22, RBS-SED23,

Hazardous Substance: Lead
Bioaccumulation Potential: 5,000

(Ref. 2, p. BI-8; 17, pp. 9, 16, 41-43; 22, pp. 32-35, 38-40, 57-58)

Source 2 – Western Jetty of the Cheesequake Creek Inlet

Sample ID: Source 2 – RBS-SED27, RBS-SED28, RBS-SED29, RBS-SED30, RBS-SED31, RBS-SED32, RBS-SED35

Hazardous Substance: Lead
Bioaccumulation Potential: 5,000

(Ref. 2, p. BI-8; 17, pp. 9-10, 16, 31; 24, pp. 2-7, 10)

Identity of Fishery	Type of Surface Water Body	Dilution Weight	Reference(s)
Source 1 - Raritan Bay	Coastal Tidal Water (flow and depth not applicable)	0.00001	1, p. 51613; Ref. 4, Figures 1 and 2; 9, pp. 3, 4, 5
Source 2 - Raritan Bay	Coastal Tidal Water (flow and depth not applicable)	0.00001	1, p. 51613; Ref. 4, Figures 1 and 2; 9, pp. 4, 5, 9

There are two Level II observed releases of lead, which has a bioaccumulation factor of 500 or greater, to two separate fisheries associated with the Raritan Bay, (Ref. 1, p. 51620; 2, p. BI-8; 9, pp. 3, 4, 5). Therefore, the food chain individual factor is assigned the value of 45 (Ref. 1, p. 51592, 51620). Since the territorial sea boundary is located in the at the northern point of area of Sandy Hook, which is approximately 12 miles east of Sources 1 and 2, the Raritan Bay fisheries are considered to be in coastal tidal waters (Ref. 4, Figure 3; 27, pp. 3, 5).

==========

Food Chain Individual Factor Value: 45

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

The Level I Concentrations Factor Value is 0 because there are no fisheries subject to Level I concentrations (Ref. 1, pp. 51620, 51621).

Level I Concentrations Factor Value: 0

4.1.3.3.2.2 Level II Concentrations

Actual Contamination of the Raritan Bay is documented through the observed release of lead to the Raritan Bay from both sources (Source 1 and Source 2) via direct observation and chemical analysis. (See Section 4.1.2.1.1 of this documentation record.) Raritan Bay is a fished for consumption in the immediate area of Sources 1 and 2.

Source	Identity of Fishery	Annual Production (pounds)	Surface Water Body	Reference	Human Food Chain Population Value
1	Raritan Bay	>1	Coastal Tidal Water	1, p. 51621; 9, pp. 3-5, 10-12 15, 23, 26; 17, pp. 5, 8-12, 16; 18, pp. 7-9; 22, pp. 6, 7, 9-12, 15, 57-61, 65; 23, pp. 30-40; 24, pp. 2-13; 27, pp. 3, 5	0.03
2	Raritan Bay	>1	Coastal Tidal Water	1, p. 51621; 9, pp. 2, 3, 7, 8, 15, 17, 19, 24, 25; 17, pp. 5, 7, 10, 11, 16; 18, pp. 2-6; 23, pp. 64-65; 25, pp. 8-12, 15, 16; 27, pp. 3, 5	0.03

Level II Concentrations Factor Value: 0.06

4.1.3.3.2.3 Potential Human Food Chain Contamination

Identity of Fishery	Annual Production (pounds)	Type of Surface Water Body	Average Annual Flow (cfs)	Population Value (P_i)	Dilution Weight (D_i)	$P_i x D_i$

Because a maximum score of 100.00 was achieved for the surface water migration pathway without considering potential fishery production within the 15-mile TDL, Potential Human Food Chain Contamination was not scored.

Sum of P_i x D_i: NS
(Sum of P_i x D_i)/10: NS

==========

Potential Human Food Chain Contamination Factor Value: NS

4.1.4.2 Environmental Threat - Waste Characteristics

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

Hazardous Substance*	Source Numbers	Ecotoxicity Factor Value	Persistence Factor Value**	Fresh Water Bioaccumulation Factor Value***	Ecotoxicity/ Persistence/ Bioaccumulation Factor Value (Table 4-21)	Reference
Lead	1, 2, OR	1,000	1	50,000	5.0×10^7	2, p. BI-8

OR – Observed Release

* Lead is documented in the observed releases by direct observation and chemical analysis.

** The persistence factor value for Rivers also applies to coastal tidal waters. See HRS Table 4-10 and HRS Section 4.1.2.2.1.2 (Ref. 1, p. 51612).

*** Average salinity measurements for Raritan Bay collected by Weston in October 2008 during high tide indicated a brackish water environment (Ref. 9, p. 6). In accordance with Section 4.1.3.2.1.3 of Reference 1, if the fishery being evaluated is located in brackish water, the higher of the salt water or fresh water bioaccumulation potential factor values of a hazardous substance may be assigned (Ref. 1, p. 51617). Therefore, the fresh water bioaccumulation potential factor for lead is assigned.

Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value: 5×10^7

4.1.4.2.2 Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity (HWQ) Value (Section 2.4.2.1.5.)	Is source hazardous constituent quantity data complete? (yes/no)
1	4,948	no
2	2,283.84	no
Sum of Values:	7,232	

(rounded to nearest integer as specified in HRS Section 2.4.2.2 [Ref. 1, p. 51591])

The sum of values for source hazardous waste quantity factor values as determined in Section 2.4.2.2 of the documentation record corresponds to a value of 100 in Table 2-6 of the HRS (Ref. 1, p. 51591). Since surface water targets are subject to Level II contamination, then either the value of Table 2-6 or a value of 100 is assigned, whichever is greater (Ref. 1, p. 51592). Therefore, the hazardous waste quantity factor value of 100 is assigned.

4.1.4.2.3 Waste Characteristics Factor Category Value

One hazardous substance (i.e., lead) associated with waste sources that have a surface water pathway containment factor greater than 0 for the Raritan Bay watershed corresponds to the maximum ecotoxicity/persistence factor value (1,000) and bioaccumulation factor value (5,000), as shown previously.

(Ecotoxicity/persistence factor value) x (hazardous waste quantity factor value) = $1{,}000 \times 100 = 1 \times 10^5$

(Ecotoxicity/persistence factor value x hazardous waste quantity factor value) x (bioaccumulation potential factor value) = $(1 \times 10^5) \times (50{,}000) = 5 \times 10^9$

The product corresponds to the maximum Waste Characteristics Factor Category Value of 180 in Table 2-7 of the HRS (Ref. 1, pp. 51592, 51620).

Hazardous Waste Quantity Factor Value: 100
Waste Characteristics Factor Category Value: 180

4.1.4.3 Environmental Threat - Targets

Actual Contamination of the Raritan Bay is documented through the observed release of lead to the Raritan Bay from both sources (Source 1 and Source 2) via direct observation and chemical analysis. Raritan Bay is part of the New York-New Jersey Harbor Estuary, which is a sensitive area identified under the National Estuary Program (Ref. 13, pp. 1-11). Raritan Bay is also used for the protection and maintenance of aquatic life (Ref. 14, pp. 1-13).

Level I Concentrations
N/A

Level II Concentrations – Source 1
Sample ID: RBS-S01A, RBS-S02A, RBS-S03A
Sample Medium: Soil/waste
Distance from PPE1: 0 feet

Ref. 17, p. 5; 18, pp. 7, 8, 9

Level II Concentrations – Source 2
Sample ID: RBS-S07A, RBS-S59A, RBS- S60A, RBS-S97, RBS-S98,
Sample Medium: Soil/waste
Distance from PPE2: 0 feet

Ref. 17, pp. 5, 7, 8, 16; 18, pp. 2, 3, 4, 5, 6

Hazardous Substance	Hazardous Substance Concentration
Lead (Source 1)	High Concentration: 31,500 ug/L
Lead (Source 2)	High Concentration: 1,230,000 ug/L

ug/L – micrograms per liter

Ref. 17, p. 5; 18, pp. 6, 7

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.1 Level I Concentrations

No Level I concentrations were documented. The Level I Concentrations Factor Value is 0 (Ref. 1, p. 51625).

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Level I Concentrations Factor Value: 0

4.1.4.3.1.2 Level II Concentrations

Sensitive Environments

The entire Raritan Bay, including its interface with Source 1 and Source 2, is part of the New York-New Jersey Harbor Estuary. The New York-New Jersey Harbor Estuary is a sensitive area identified under the National Estuary Program (Ref. 13, pp. 1-11). The entire drainage of Raritan Bay, including its interface with Source 1 and Source 2, is also a state-designated water body for the maintenance of aquatic life (Ref. 14, pp. 1-13).

Sensitive Environment	Distance from PPE to Sensitive Environment	Reference	Sensitive Environment Value(s)
NY-NJ Harbor Estuary (Sensitive Area identified under National Estuary Program)	0.00 mile*	1, p. 51624; 13, pp. 1-11	100
Raritan Bay (State designated area for protection or maintenance of aquatic life)	0.00 mile*	1, p. 51624; 14, pp. 1-13	5

* Raritan Bay is considered a sensitive environment at its interface with sources 1 and 2; therefore, the distance to each source's respective PPE is considered to be 0.00 mile.

Sum of Sensitive Environments Value: 105

Wetlands

Wetland	Wetland Frontage	Reference(s)
N/A		

Total Wetland Frontage: N/A
Wetland Value: 0

Sum of Sensitive Environments Value + Wetland Value: 0

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Level II Concentrations Factor Value: 105

4.1.4.3.1.3 Potential Contamination

Since a maximum score of 100.00 was achieved for the surface water migration pathway, the Potential Contamination Factor Value was not scored (NS).

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Potential Contamination Factor Value: NS

4.2 OTHER POSSIBLE CONTAMINATED SURFACE WATERS

The Margaret's Creek area is characterized by elevated levels of lead (Ref. 30, p. 4; 32). The area is approximately 47 acres in size and is owned by the Township of Old Bridge (Ref. 31, p. 6). The predominantly tidal marsh area shows evidence of at least 20 acres of fill material (Ref. 31, p. 9). The NJDEP conducted a site investigation of the area in December 2006 and determined that only minor amounts of non-soil materials were encountered at only one of eleven test pits dug using a skid steer backhoe; test pits were dug to native material (Ref. 30, p. 2).

Lead source material was evident throughout Margaret's Creek, including large amounts of what appeared to be shredded automotive battery casings, brick - including refractory brick, and slag, which suggest the disposal of industrial waste (Ref. 30, p. 3). The NJDEP representatives, on March 4, 2007, collected samples in areas devoid of vegetation in which refractory brick, slag, and other materials were evident (Ref. 30, p. 3).

Lead was detected in those March 2007 samples in concentrations ranging from 701 ppm to 146,000 ppm, with an average concentration on 50,482 ppm (Ref. 30, p. 4; 32).

An observed release by direct observation of lead could most likely be established based on the observation of lead-containing material within and still in contact with the wetlands (Ref. 31). Materials similar in nature to those found at the seawall and western jetty have been found at Margaret's Creek as well, and similar environmental releases have been demonstrated based on the information previously presented in earlier parts of this HRS documentation record.

Margaret's Creek is situated adjacent to sensitive environments, including HRS eligible wetlands, and habitat for state threatened species: the Black Crowned Night Heron (Refs. 6, p. 1; 11, p. 2; 30, p. 4; 33, p. 1; 34, p. 1).

APPENDIX A

SOURCE-SPECIFIC SCORESHEETS

The Raritan Bay Slag site contains two areas of waste deposition along the southern shoreline of the Raritan Bay. Since there are two separate observed releases to the Raritan Bay by direct observation (i.e., one from each source), source-specific scoresheets were generated in the evaluation of this site. These source-specific scoresheets, on a line by line basis, refer to the relevant page in the HRS documentation record where the values were determined and show that even if the two sources were evaluated independently, they both would qualify for listing.

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
RARITAN BAY SLAG – SOURCE 1 (LAURENCE HARBOR SEAWALL)

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors DRINKING WATER THREAT	MAXIMUM VALUE	VALUE ASSIGNED	HRS DOCUMENTATION RECORD PAGE
Likelihood of Release			
1. Observed Release	550	550	pp. 21-24, 26-27
2. Potential to Release by Overland Flow			
2a. Containment	10	not scored	
2b. Runoff	25	not scored	
2c. Distance to Surface Water	25	not scored	
2d. Potential to Release by Overland Flow [lines 2a (2b+2c)]	500	not scored	
3. Potential to Release by Flood			
3a. Containment (Flood)	10	not scored	
3b. Flood Frequency	50	not scored	
3c. Potential to Release by Flood (lines 3a x 3b)	500	not scored	
4. Potential to Release (lines 2d+3c)	500	not scored	
5. Likelihood of Release	550	550	
Waste Characteristics			
6. Toxicity/Mobility	*	10,000	p. 28
7. Hazardous Waste Quantity	*	100	p. 29
8. Waste Characteristics	100	32	p. 29
Targets			
9. Nearest Intake	50	0	p. 31
10. Population			
10a. Level I Concentrations	**	0	p. 32
10b. Level II Concentrations	**	0	p. 33
10c. Potential Contamination	**	0	p. 34
10d. Population (lines 10a+10b+10c)	**	0	
11. Resources	5	5	p. 35
12. Targets (lines 9+10d+11)	**	5	
13. DRINKING WATER THREAT SCORE ([lines 5 x 8 x 12]/82,500)	100	1.06	

* Maximum value applies to waste characteristics category.
** Maximum value not applicable

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
RARITAN BAY SLAG – SOURCE 1 (LAURENCE HARBOR SEAWALL)

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors HUMAN FOOD CHAIN THREAT	MAXIMUM VALUE	VALUE ASSIGNED	HRS DOCUMENTATION RECORD PAGE
Likelihood of Release			
14. Likelihood of Release (same as line 5)	550	550	pp. 21-24, 26-27
Waste Characteristics			
15. Toxicity/Persistence/Bioaccumulation	*	5.00E+07	p. 36
16. Hazardous Waste Quantity	*	100	p. 37
17. Waste Characteristics	1,000	180	p. 37
Targets			
18. Food Chain Individual	50	45	p. 41
19. Population			
19a. Level I Concentrations	**	0	p. 42
19b. Level II Concentrations	**	0.03	p. 42
19c. Potential Human Food Chain Contamination	**	0	p. 43
19d. Population (lines 19a+19b+19c)	**	0.03	
20. Targets (lines 18+19d)	**	45.03	
21. HUMAN FOOD CHAIN THREAT SCORE ([lines 14 x 17 x 20]/82,500)	100	54	

* Maximum value applies to waste characteristics category.
** Maximum value not applicable

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
RARITAN BAY SLAG – SOURCE 1 (LAURENCE HARBOR SEAWALL)

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors ENVIRONMENTAL THREAT	MAXIMUM VALUE	VALUE ASSIGNED	HRS DOCUMEN-TATION RECORD PAGE
Likelihood of Release			
22. Likelihood of Release (same as line 5)	550	550	pp. 21-24, 26-27
Waste Characteristics			
23. Ecosystem Toxicity/Persistence/Bioaccumulation 24. Hazardous Waste Quantity 25. Waste Characteristics	* * 1,000	5.00E+07 100 180	p. 44 p. 45 p. 45
Targets			
26. Sensitive Environments 26a. Level I Concentrations 26b. Level II Concentrations 26c. Potential Contamination 26d. Sensitive Environments 27. Targets (line 26d)	 ** ** ** ** **	 0 105 not scored 105 105	 p. 47 p. 47 p. 48
28. ENVIRONMENTAL THREAT SCORE ([lines 22 x 25 x 27]/82,500)	60	60	
29. WATERSHED SCORE (lines 13 + 21 + 28)	100	100	
30. SW: OVERLAND/FLOOD COMPONENT SCORE (S_{of})	100	100	
SURFACE WATER MIGRATION PATHWAY SCORE (S_{sw})	100	100	

* Maximum value applies to waste characteristics category.
** Maximum value not applicable

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
RARITAN BAY SLAG – SOURCE 2 (WESTERN JETTY – CHEESEQUAKE CREEK INLET)

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors DRINKING WATER THREAT	MAXIMUM VALUE	VALUE ASSIGNED	HRS DOCUMENTATION RECORD PAGE
Likelihood of Release			
1. Observed Release	550	550	pp. 21, 25-27
2. Potential to Release by Overland Flow			
2a. Containment	10	not scored	
2b. Runoff	25	not scored	
2c. Distance to Surface Water	25	not scored	
2d. Potential to Release by Overland Flow [lines 2a (2b+2c)]	500	not scored	
3. Potential to Release by Flood			
3a. Containment (Flood)	10	not scored	
3b. Flood Frequency	50	not scored	
3c. Potential to Release by Flood (lines 3a x 3b)	500	not scored	
4. Potential to Release (lines 2d+3c)	500	not scored	
5. Likelihood of Release	550	550	
Waste Characteristics			
6. Toxicity/Mobility	*	10,000	p. 28
7. Hazardous Waste Quantity	*	100	p. 29
8. Waste Characteristics	100	32	p. 29
Targets			
9. Nearest Intake	50	0	p. 31
10. Population			
10a. Level I Concentrations	**	0	p. 32
10b. Level II Concentrations	**	0	p. 33
10c. Potential Contamination	**	0	p. 34
10d. Population (lines 10a+10b+10c)	**	0	
11. Resources	5	5	p. 35
12. Targets (lines 9+10d+11)	**	5	
13. DRINKING WATER THREAT SCORE ([lines 5 x 8 x 12]/82,500)	100	1.06	

* Maximum value applies to waste characteristics category.
** Maximum value not applicable

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
RARITAN BAY SLAG – SOURCE 2 (WESTERN JETTY – CHEESEQUAKE CREEK INLET)

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors HUMAN FOOD CHAIN THREAT	MAXIMUM VALUE	VALUE ASSIGNED	HRS DOCUMENTATION RECORD PAGE
Likelihood of Release			
14. Likelihood of Release (same as line 5)	550	550	pp. 21, 25-27
Waste Characteristics			
15. Toxicity/Persistence/Bioaccumulation	*	5.00E+07	p. 37
16. Hazardous Waste Quantity	*	100	p. 38
17. Waste Characteristics	1,000	180	p. 38
Targets			
18. Food Chain Individual	50	45	p. 41
19. Population			
19a. Level I Concentrations	**	0	p. 42
19b. Level II Concentrations	**	0.03	p. 42
19c. Potential Human Food Chain Contamination	**	0	p. 43
19d. Population (lines 19a+19b+19c)	**	0.03	
20. Targets (lines 18+19d)	**	45.03	
21. HUMAN FOOD CHAIN THREAT SCORE ([lines 14 x 17 x 20]/82,500)	100	54	

* Maximum value applies to waste characteristics category.
** Maximum value not applicable

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
RARITAN BAY SLAG – SOURCE 2 (WESTERN JETTY – CHEESEQUAKE CREEK INLET)

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors ENVIRONMENTAL THREAT	MAXIMUM VALUE	VALUE ASSIGNED	HRS DOCUMENTATION RECORD PAGE
Likelihood of Release			
22. Likelihood of Release (same as line 5)	550	550	pp. 21, 25-27
Waste Characteristics			
23. Ecosystem Toxicity/Persistence/Bioaccumulation 24. Hazardous Waste Quantity 25. Waste Characteristics	* * 1,000	5.00E+07 100 180	p. 44 p. 45 p. 45
Targets			
26. Sensitive Environments 26a. Level I Concentrations 26b. Level II Concentrations 26c. Potential Contamination 26d. Sensitive Environments 27. Targets (line 26d)	 ** ** ** ** **	 0 105 not scored 105 105	 p. 47 p. 47 p. 48
28. ENVIRONMENTAL THREAT SCORE ([lines 22 x 25 x 27]/82,500)	60	60	
29. WATERSHED SCORE (lines 13 + 21 + 28)	100	100	
30. SW: OVERLAND/FLOOD COMPONENT SCORE (S_{of})	100	100	
SURFACE WATER MIGRATION PATHWAY SCORE (S_{sw})	100	100	

* Maximum value applies to waste characteristics category.
** Maximum value not applicable